# CHEM-BIO DEFENSE

Quarterly

Vol. 3 No. 2

**"Chemical Biological Defense Program is a High Priority on Capitol Hill"**

**Dugway Expands Facilities for Safe Biological Research and Testing**

**Garrett Augustus Morgan, Owner of the Gas Mask Patent**

Cover: U.S. Army Soldiers raise the flag in a ceremony presided by U.S. Amb. John D. Negroponte, signifying the establishment of the new U.S. Embassy Regional Office in Al Hilla, Iraq, on July 15, 2004. Photo by U.S. Air Force Staff Sgt Ashley Brokop.

Back cover photo by Steven Lusher , Camber Corporation. A Sailor aboard the *USS Bonhomme Richard* (LHD-6), wearing the Joint Service General Purpose Mask and Joint Service Lightweight Integrated Suit Technology, loads an air filter into its housing. The filter and housing are part of the Shipboard Collective Protective System Backfit that was completed aboard the ship February 24, 2006.

**Two U.S. Army Soldiers use binoculars and a riflescope to watch for insurgents downrange as they conduct a combat patrol near the Syrian border in Iraq on March 6, 2006. The Soldiers are attached to Foxtrot Troop, 1st Armored Division. DoD photo by Staff Sgt. Aaron Allmon, U.S. Air Force.**

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# Guest Columnist: Capt. Thomas O'Keefe, USN

*Capt. Thomas O'Keefe, Joint Project Manager, Information Systems*

I have the pleasure of introducing a new element of the Chem-Bio Defense Quarterly magazine. Throughout the course of the next several issues, each Joint Project Manager from the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD) will write the opening remarks here, where Brig. Gen. Stephen Reeves' comments normally appear. I will start with a brief overview of my program.

The modern chemical and biological warfighter depends on rapid and accurate situational awareness and command and control. The Joint Project Office for Information Systems (JPM IS) is developing the command and control systems that connect chemical and biological warfighters across the battlespace. We are also providing the tools they need to analyze chemical and biological threats for timely, accurate decisions. These systems are the Joint Warning and Reporting Network (JWARN), the Joint Effects Model (JEM), and the Joint Operational Effects Federation (JOEF). We are developing them together so the warfighter will experience a common "look and feel." This commonality increases combat effectiveness as well as reduces training and sustainment costs and allows future enhancements to be incorporated quickly.

We are also equipping warfighters in Iraq with new capabilities. We updated the present JWARN to provide greater connectivity and provided hand held Chemical Biological Response Aid (COBRA) decision support tools to chemical and biological warfighters. Job number one at JPM IS is responding to the needs of our forces operating in harm's way.

The number one job of our magazine is ensuring the chemical and biological community has the most current and accurate information available.

In this issue, we take a close look at the collective protection retrofit onboard the amphibious assault ship *USS Bonhomme Richard* (LHD-6). Joint Project Manager for Collective Protection is providing protected zones that will allow shipboard personnel to work safely while the ship traverses contaminated areas. We also present an interview with Mr. Jean D. Reed, the recently appointed Special Assistant for Chemical and Biological Defense and Chemical Demilitarization Programs. Mr. Reed shares his views on the current status of the chemical and biological defense program and discusses the future of the program. His previous position as a House Armed Services Committee professional staff member allows him a unique perspective on the chemical and biological defense programs.

Please note the Department of Defense (DoD) Chemical and Biological Defense Advance Planning Briefing for Industry (APBI) will be held April 10 - 11, 2006, at the Washington Convention Center, Washington, D.C. This is our annual event to inform industry of business opportunities and includes senior level DoD representatives who will speak about the Chemical and Biological Defense Program's direction, business opportunities and future requirements. Our website at www.jpeocbd.osd.mil has registration details as well as specific information about the event.

Finally, I encourage you to take a moment to complete and return our annual readership survey. The survey will tell us if we are meeting your expectations and gives you the chance to tell us what you would like to see in future issues.

Enjoy this issue of Chem-Bio Defense Quarterly. We look forward to hearing from you!




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1. How did you first hear about Chem-Bio Defense Magazine?

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3. What have you learned from reading this publication?

4. What comments do you have about the content?

5. What type of articles would you like to see in future issues?

6. How do you like the layout and design of the publication?

7. What would you change overall about the publication?

8. How can this publication be improved?

9. Is there anything you have expected to read about but have yet to see?

10. Are there any additional comments you would like to share about Chem-Bio Defense Quarterly?

# Diverse Missions Converge With Collaborations

Photo by Doug Valentine

Dr. Howard Young of the National Cancer Institute, Frederick, MD, has collaborated with Ebola researcher Dr. Tom Geisbert (pictured on page 7) of the U.S. Army Medical Research Institute of Infectious Diseases to see if cancer researchers can harness the method Ebola uses to cause cell death to kill cancer cells.

*By Karen Fleming-Michael, U.S. Army Medical Research and Materiel Command*

Two researchers at very different institutes on Fort Detrick have taken advantage of their neighbors' expertise and proximity to further science and their laboratories interests.

Dr. Howard Young, an immunologist at the National Cancer Institute-Frederickm MD, and Dr. Tom Geisbert, a virologist at the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID), have worked together on Ebola and Marburg viruses since 2000. Though Young is a cancer researcher interested in immunology and Geisbert is a biodefense researcher searching for vaccines and treatments for hemorrhagic fevers, their collaborations mesh with their institutes' missions.

"You may say, 'That's odd—if you're doing cancer research what are you doing working on Ebola?'" Young said. "It turns out cancer is thought to arise from long-term chronic inflammation. Ebola is a short term, massive inflammation. The differences, although they may seem large, are not necessarily. The more we learn about how Ebola causes cell death and the death of its host, (we may find) ways we can turn that same action against cancer but in a way that we're killing cancer cells instead of the normal cells."

Geisbert said Young's willingness to look at a problem from a different angle makes him a good part of a research team.

"I think Dr. Young approaches it from a different perspective. He has a very strong background in immunology and immunologists look at it from the 30,000-foot view. It's different," he said. "If you come in and zone in on what you're doing, you get tunnel vision. I think it's very helpful when you bring in somebody from the outside and they look at things with a totally different perspective. A lot of times that can make a difference."

The first study they undertook explored the mechanism of action of the Ebola virus. Researchers knew what damage the virus ultimately inflicts on its host, but wanted to know what happened at each step of infection.

"We wanted to understand the disease course in a frame-by-frame scenario so we could understand where we might possibly intervene," Geisbert said. "We were looking at it temporally: what happens, when does it happen, what triggers what."

To get those snapshots of the disease, Geisbert's team, Young's laboratory and a researcher from Stanford University, David Relman, undertook one of the biggest studies Geisbert's has ever attempted. Over six days, 21 monkeys were infected with the virus. Three or four were sacrificed each day to see how Ebola progresses. Multiple samples were collected daily from each monkey, and the disease markers were studied both at USAMRIID and at NCI-Frederick. After ensuring samples contained no virus, USAMRIID passed hundreds of them to Young's experimental immunology laboratory, which did all the Ribonecleic Acid expression assays that looked for markers that show the disease process and what was happening.

"It's not that we couldn't have done (the work) here, but when you partner with people we can be more efficient and do what we do well and let Dr. Young do what he's very good at," Geisbert said. "You try to exploit everybody's skills. I think everybody wins."

Geisbert, who has been with USAMRIID since 1985, said that study yielded invaluable information on the virus. The group learned that though certain white blood cells aren't infected with Ebola, they still die, which means the virus disarms the host's immune system a lot faster than once thought. They also learned that the abnormal blood clotting the virus causes—which leads to massive hemorrhage and death—also occurred very early as well, even before the virus is detectable in the blood.

"We have a better understanding of the coagulation disorders, and it gave us insight in how to design countermeasures against them to improve survival and tip the balance in favor of the host," he said. As a result, his group has explored using a protein called NAPc2, which stands for recombinant nematode anticoagulant protein c2, to interfere with the massive blood clotting. When given to monkeys, it protected a third of them from infection with Ebola and delayed death in the ones that died from the virus. Another drug, used for patients with sepsis, is also being considered as a possible intervention.

For the cancer researchers, the findings didn't have an immediate translation, Young said, but they did tell him how the immune system is activated in cases of acute inflammation. An expert in natural killer, or NK cells, he now has a better understanding of why NK cells were killed during an Ebola infection and may put that to use in his cancer research.

"There's not always going to be an immediate 'aha,' but we learned something about the sequence of events that occurred and leads to the NK cell death, so maybe in some patients, NK cells are dying and not able to kill cancer cells. The more we learn about that, the better we may be able to manipulate them in order to enhance their ability to kill cancer cells," he said.

Gaining that knowledge points to one of Young's crusades: getting scientists to work on answering questions together. From attending the NCI-Frederick's weekly lunchtime science forums, to organizing the Summer Student Seminar Series and creating the Spring Research Festival, he's continually championed the need to meet and work with other scientists, regardless of the institute for which they work. In fact, Young's first collaboration with USAMRIID came about more than a decade ago after hearing Nancy Jaax, a USAMRIID researcher, speak about Ebola during one of the lunchtime sessions. As a result of that first meeting, Young has studied Ebola, its cousin Marburg, anthrax and toxins with investigators at the Army institute.

"I am fully of the belief that better science can be done when you have many minds focusing on a project. We (NCI) have more than 100 principal investigators here with tremendous expertise so there's really an enormous wealth of talent in biological sciences here," he said. "There's a whole lot of scientific questions for laboratories to collaborate on, and it's a matter of getting people out of their laboratories, making them realize what's out there and encouraging them to utilize the expertise that's available in the different organizations."

With the National Interagency Biodefense Campus already in the works on Fort Detrick, Young, with the NCI-Frederick since 1983, wants more working relationships to develop through what he calls the four Cs: communication, consultation, cooperation and collaboration.

"We need to have venues where people are not only encouraged to report their successes but report their failures because you learn from those failures and other people might be able to guide you around the problem," he said. "That's why we have to promote ways to ensure laboratories interact because you don't want people looking at the same thing and not knowing the same work is being done elsewhere. You want people working together, synergizing and complementing each other."

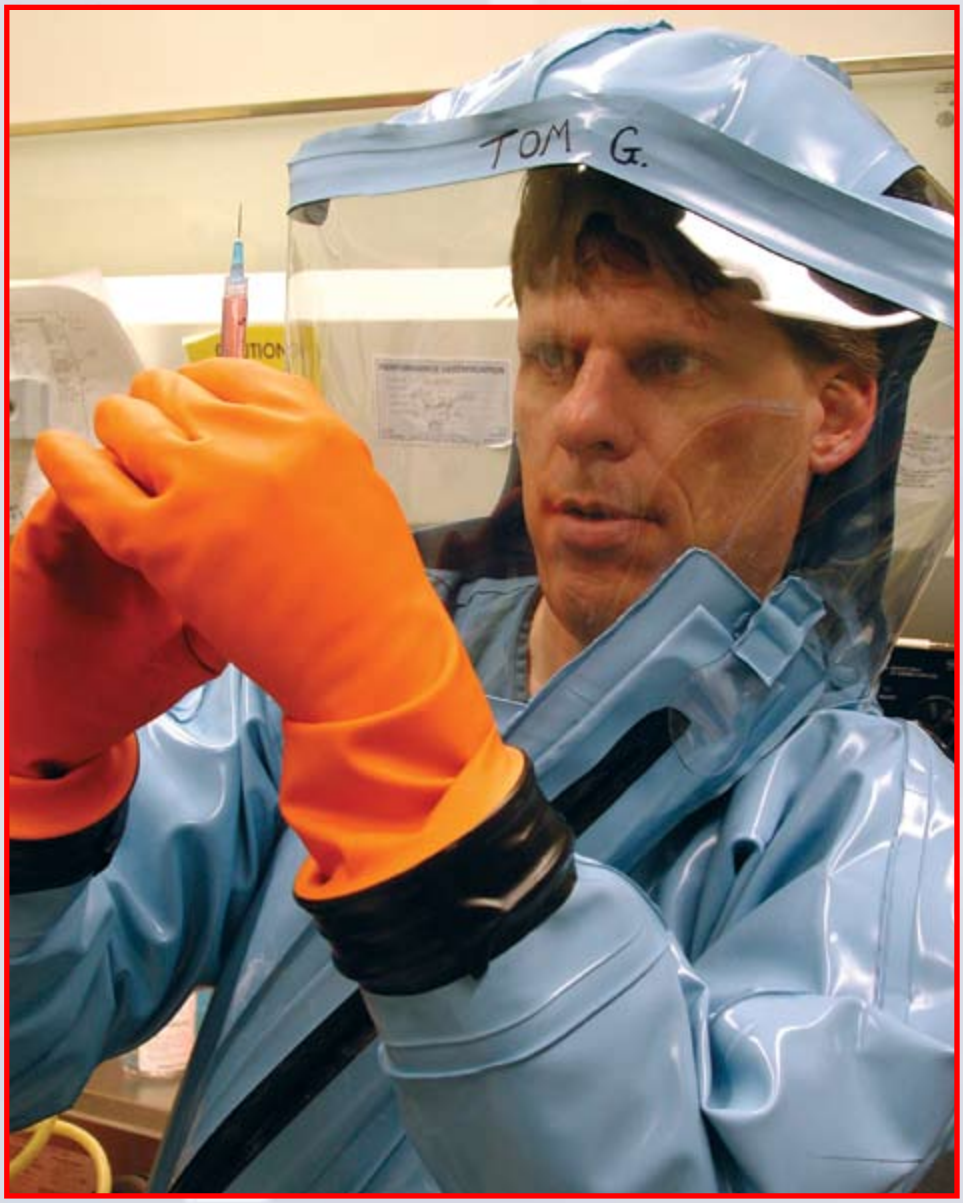



Photo by Joan Geisbert

Dr. Tom Geisbert, a virologist at the U.S. Army Medical Research Institute of Infectious Diseases, Frederick, MD, has worked on Ebola and Marburg viruses since 2000.

# Gene-Specific Ebola Therapies Protect Nonhuman Primates from Lethal Disease

*By Caree L. Vander-Linden,*
*U.S. Army Medical Research Institute of Infectious Diseases*
*Public Affairs Office*

It was February 11, 2004, and the female scientist was working in a Bio-Safety Level 4 maximum containment laboratory at Fort Detrick, MD. Filtered breathing air flowed continuously into her powder-blue, pressurized vinyl suit; her hands moved slowly and deliberately in their two layers of gloves. It was just another day at the U.S. Army Medical Research Institute of Infectious Diseases, commonly known as USAMRIID but suddenly, something went wrong.

In her quest to find a treatment for Ebola, one of the deadliest pathogens known, the scientist accidentally exposed herself to the virus. While she was treating Ebola-infected mice with antibodies, one of the tiny animals kicked the syringe and the needle grazed the base of her thumb.

"At first I didn't think the needle had broken through my two layers of gloves, but when I put the mouse down to squeeze my hand, blood appeared under my gloves," she recalled later. "I followed the prescribed emergency procedures and reported to our medical division. They decided to isolate me for three weeks, which is the incubation period for Ebola virus."

According to Col. George W. Korch, USAMRIID commander, "Accidents of this type are extremely rare, but we have the necessary processes in place for handling them. Our responses to these unusual events are designed both to help the laboratory worker and to protect public health."

For the next 21 days USAMRIID's patient isolation suite-a hospital room equipped to operate at Biosafety Level 4-became the scientist's home. Medical personnel constantly monitored her condition, ready to provide supportive care should she exhibit symptoms of Ebola-a hemorrhagic fever for which no vaccine and no therapies exist.

Coincidentally, earlier that very day, Dr. Patrick Iversen, from a Portland, OR-based pharmaceutical company called AVI Biopharma, Inc., had presented his data concerning the efficacy of novel "antisense" drugs against a range of viruses. When he found out that a USAMRIID scientist had been exposed to Ebola virus, his company volunteered to design and synthesize compounds against the virus to treat her if the need arose.

**Ebola virus causes hemorrhagic fever with case fatality rates as high as 80 percent in humans.**

Working with a class of compounds known as antisense phosphorodiamidate morpholino oligomers, or PMOs, the team at AVI worked for four days straight to generate human-grade anti-Ebola compounds. In the meantime, their regulatory staff worked with USAMRIID physicians to gain emergency approval from the U.S. Food and Drug Administration to use the compounds if necessary. Just five days after the exposure, the president of AVI arrived at USAMRIID to hand-deliver the compounds to the Institute's medical team.

Fortunately, the scientist escaped infection from the Ebola virus, so the compounds were not used. However, USAMRIID went on to test them in animal models, and recently reported success in protecting 75 percent of nonhuman primates exposed to the virus. The findings could serve as the basis for a new approach to quickly develop virus-specific therapies for known, emerging and genetically engineered pathogens.

In the January 13, 2006 online issue of the journal Public Library of Science Pathogens, a USAMRIID research team led by Sina Bavari, Ph.D., reported using the antisense PMOs originally developed for the human exposure to interrupt normal Ebola virus replication in animals.

According to the authors study's, antisense drugs are useful against viral diseases because they are designed to enter cells and eliminate viruses by preventing their replication. The drugs, which act by blocking critical viral genetic sequences, may be more potent than antivirals such as protease inhibitors, which seek to inhibit a protein needed for viral replication.

Ebola virus causes hemorrhagic fever with case fatality rates as high as 80 percent in humans. The virus, which is infectious by aerosol (although more commonly spread through blood and body fluids of infected patients), is of concern both as a global health threat and a potential agent of biological warfare or terrorism.

"One advantage of this strategy is that it directly targets the virus," said Kelly L. Warfield, Ph.D, the paper's first author. "With Ebola infection, the virus grows so fast that it overtakes the host immune system. What we did, essentially, was to hold off the viral replication long enough for the host to mount a natural immune response and clear the virus."

The team first performed a series of studies to identify PMOs that demonstrated activity against Ebola virus. Next, three of the PMOs were tested in mice, both individually and in combination. The combination of all three was found to be the most effective therapeutic approach in mice, whether the PMOs were administered before or after Ebola infection. Combination therapy was also tested in guinea pigs, where it appeared to be most effective when administered after infection.

To further evaluate the efficacy of the three-PMO combination, four rhesus monkeys were treated with the drug two days prior to Ebola virus exposure. Three of the four were protected from Ebola infection (although one later succumbed to an unrelated bacterial infection).

"These results, while preliminary, are very encouraging," said Korch, "especially when you consider that Ebola virus has, to date, been fairly resistant to effective treatment. We look forward to additional findings of success using these PMOs."

Collaborating on the study with Bavari and Warfield were Dana L. Swenson, Gene G. Olinger, Donald K. Nichols, William D. Pratt, and M. Javad Aman of USAMRIID, and Robert Blouch, David A. Stein, and Iversen of AVI BioPharma.

USAMRIID, located at Fort Detrick, MD, is the lead medical research laboratory for the U.S. Biological Defense Research Program, and plays a key role in national defense and in infectious disease research. It's mission is to conduct basic and applied research on biological threats resulting in medical solutions (such as vaccines, drugs and diagnostics) to protect warfighters. USAMRIID is a subordinate laboratory of the U.S. Army Medical Research and Materiel Command.

AVI BioPharma, based in Corvallis, OR, develops therapeutic products for the treatment of life threatening diseases using third-generation NeuGene® antisense drugs. AVI's Bio Pharmers's lead NeuGene® antisense compound is designed to target cell proliferation disorders, including cardiovascular restenosis, cancer and polycystic kidney disease. In addition to targeting specific genes in the body, AVI's antiviral program uses NeuGene® antisense compounds to combat disease by targeting single-stranded Ribonecleic Acid (RNA) viruses, including West Nile virus, hepatitis C virus, dengue virus and Ebola virus.

*Reference: Warfield KL, Swenson DL, Olinger GG, Nichols DK, Pratt WD, et al. (2006) Gene-specific countermeasures against Ebola virus based on antisense phosphorodiamidate morpholino oligomers. PLoS Pathog 2(1): e1.*

*For more information on USAMRIID: www.usamriid.army.mil*

*For more information on AVI BioPharma: www.avibio.com*

*Mr. Jean Reed, 66, is the Special Assistant for Chemical and Biological Defense and Chemical Demilitarization Programs. Prior to assuming his current position, he served as a professional staff member for the House Armed Services Committee. His primary focus there included research and development, training and education, chemical demilitarization and chemical weapons convention. Mr. Reed was born in Muskogee, OK, and graduated from the University of Oklahoma with bachelor's (1960) and master's (1963) degrees in physics. He did post-graduate work in physics at Georgetown University from 1970-71 and has attended the Army War College, the National War College, the Army Command and General Staff College and the National Defense University. While on active duty, he served two tours in Vietnam, two assignments with Headquarters Army Materiel Command, Field Artillery Battalion and Battery Command, and Chief, Fire Support Division, Force Development, Office of the Deputy Chief of Staff for Operations and Plans. He retired from the Army as a colonel in 1990 after 30 years of service. Mr. Reed is a member of the American Physical Society and authored* "NATO's Theater Nuclear Forces, A Coherent Strategy for the 80's" *while he was a fellow at the National Defense University.*

# "Chemical Biological Defense Program is a High Priority on Capitol Hill"

*Interview By Stephen Gude, Assistant Editor, Chem-Bio Defense Quarterly Magazine*

**What is it like being back in the Pentagon?**

I'm back in the Pentagon now for the third time. Two tours on the Army staff, one in the mid-1970s and one in the late 1980s. I'm coming into the Office of the Secretary of Defense (OSD) for the first time, although I have had the opportunity to watch it operate and participate with it during my 15 years on Capitol Hill. The thing I'm really impressed by is the quality of the people in the office, from the ones who are part of the formal, authorized structure, to the detailees from the various commands that participate in the Chemical Biological Defense Program (CBDP), to the contractor support that's here. The quality of the people, the overall education level and the talents they bring to this job are just really impressive.

The other piece is the intensity of the work that's going on. Maybe it's just characteristic of where we are, two echelons down from the secretary of defense. We need to be able to react very quickly to what comes down from the secretary's office; literally, a requirement can come down at 11:30 and he can say 'I want a response by 12,' and we are able to respond.

The other piece, I guess you could say, is the change from the way the building used to work, when it was mainly shoe leather that was used to deliver messages. Now, we're all connected.

**From your career in the Army to now, have you noticed anything different (in the CBDP)?**

The biggest difference is that chemical and biological defense is taken much more seriously by the Armed Forces in general than before to the extent that (in the Army), it was once just the province of the chemical officer, the Chemical Corps and a relatively limited number of people in the units who were knowledgeable and focused on chemical-biological defense. In the 1960s and 1970s in Germany, chemical and biological defense was looked at primarily as a chemical threat and the overall program really was almost cyclical, at least in the Army, regarding the amount of emphasis it received. So much so, that at one point, the Chemical Corps literally went away and became a part of the Ordnance Corps in the mid-1970s. Almost on a 10- to 15-year cycle, the emphasis or lack of

emphasis in the Army on chemical and biological defensive training was apparent. It was really viewed as a detractor to my mission of firing rounds against the hordes as they came across the northern German plain.

After I retired from the Army and went to the house staff in the summer of 1990, I went to the House Armed Services Committee literally four days before the invasion of Kuwait. A great deal of time and money were spent preparing U.S. forces to be able to fight against the threat Saddam Hussein posed, because he used chemical weapons against Iran (during the Iran-Iraq War, 1980-88) and internally against his own people, so that threat was very real.

**Was it primarily the chemical threat we were concerned with back then?**

It was primarily chemical, but coming out of that, the emphasis has pretty much stayed on the need for the readiness of the forces to be able to fight in a chemical-biological environment, and it has been emphasized even more as we have gotten a better understanding of the biological and the terrorist threats. You could recognize as we approached the Gulf War that there was a potential stockpile the Iraqis had that could be used against the forces and in fact, you may remember that as the Marines went through the Hussein's "line of death" across the Kuwait border, they felt they were getting some detections.

**Were these the seeds sown for the Joint Program Executive Office?**

Coming out of that experience, I had the opportunity to work with Congressmen Glen Browder (D-AL), Larry Hopkins (R-KY) and Martin Lancaster (D-NC) to look at the chemical-biological threat in the post-Soviet era. That was a nine month study that looked at the range of threats and speculated on some other threats that could develop. In effect it said we have four separate service programs, Army, Navy, Air Force and Marine Corps, and in some areas they worked very closely, but in others, there was no coordination. We were pursuing the development of x-number of different suits and y-number of different masks and we looked at it and said 'this needs to get pulled together.' The conclusion of the Browder Panel was the need to establish a focal point office within the OSD to pull together the program for all of the services. Lo and behold, I find myself today in that office, and it certainly wasn't planned at the time.

From a Department of Defense (DoD) perspective, that focus has become even more important as we have gone through 9/11, the attack in the Tokyo subways, the increased risk of terrorism on the part of national and extra-national entities, asymmetrical warfare being a very real threat, and Oklahoma City, although conventional, heightened awareness on domestic terrorism or international terrorism applied domestically.

Photo by Steve Lusher

**How will you relate what you did in your congressional role to what you will be doing in your new capacity as Special Assistant for Chemical and Biological Defense and Chemical Demilitarization Programs?**

In my 15 years as a professional staffer and through experiences such as leading the Browder Panel, I have established a perspective on CBDP, not just from the standpoint as a professional on Capitol Hill, but as an Army officer. I can state with certainty that chemical and biological defense continues to be a priority for

Photo by Steve Lusher

the people whose job it is to think about what we're doing and the equipment we're providing to the men and women who are the jewels of our nation. Chemical and biological defense issues have been high-profile since the Gulf War, when the threat became very real to the Armed Forces who were going to fight there. Nowadays, we're seeing other emerging threats that we have to address, but it's something the DoD can't do alone.

**Do those emerging threats include the possible use of industrial chemicals by terrorists?**

That's one of the emerging issues. It runs the gamut from our people looking at industrial chemicals and its possible use by terrorists to the public health aspects of chemicals and even decontaminants, and genetic modification of vaccines. With industrial chemicals, let me give you an example – at one point in the Balkans we were worried about the stocks of chlorine being used there. So clearly, it and the other issues are on the minds of people who make decisions here. My goal is to ensure that we get enough information to the guys on the ground. There is a need for commanders to train their people and make them aware of the threats they face.

**Can you describe your vision for CBDP for the next five years? Where do you want to take it?**

In the Quadrennial Defense Review (QDR), there is a major initiative called the Green Line, which is designed to develop countermeasures against broad-spectrum threats. It is really DARPA-esque (Defense Advanced Research Projects Agency) in its scope, being that if it is not out of the box, it is right on the edge of the box. It is high-risk, but the work that has been done indicates there's a pony in here. Let's see if the technology can be developed. There is a lot of emphasis in the medical area, covering vaccines, detection and identification. It's a major effort that will take a lot of leadership and very hard work. In answering the question, part of that includes how do we pull together the actions going on with this initiative for the troops in the field with the big powers in the Pentagon? It's a big order for us, a very big order.

**Is the CBDP a good example of cooperation between the DoD and Congress? How do you plan to use that to the advantage of the CBDP?**

I really think it is. In this case, Congress has exerted some leadership in focusing our objectives and giving a sense of purpose to what we are doing. They understand – better than a lot of people think – just who it is that they're working for and who it is we're trying to protect with the programs we have, and that's the warfighter. Congress wouldn't have it any other way, and that's something I'm proud of. It's transparent to a lot of people, but believe me, the people on Capitol Hill are greatly concerned and it shows in their attitudes and reactions to what we're doing. They ask 'What do you need from us?' but at the same time, we have to be cognizant that they want to see results. When you look at what we have with the different programs, such as the Joint Requirements Office (JRO), the Joint Science and Technology Office (JSTO) and the Joint Program Executive Office (JPEO), I think it says plenty that they don't want to leave any avenue of

possible success closed when it comes to developing and fielding solutions to chemical and biological issues.

*"The Chemical Biological challenge is going to get tougher," Reed says*

**In your view, are our warfighters better protected against chemical and biological attacks than they were 10 years ago? What areas do you think we can make improvements on?**

Yes, there have been significant improvements in equipment but it's a hard problem. We can look at this and say there is a certain percentage of improvement in the performance of this suit or sensing equipment, and there have been improvements in vaccines, but within that timeframe, I think one of the key models of improvement has come in the increased awareness and knowledge of the Soldiers, Sailors, Airmen and Marines. As I have mentioned, it comes back to the commanders and senior non-commissioned officers on the ground, training their people. These are the men and women who have been through the training and who have experience with the suits, with the detection and sensing equipment and who know the drill because they've been through it. In this case, there's no substitute for experience.

**What do you expect will be the top items of congressional interest regarding the CBDP for this year?**

The Green Line initiative. It highlights the steadily increasing investment in the CBDP. That investment is up to $1.5 billion now and Congress has to know that this money is well-spent. It will be very interesting to see what comes out of this initiative and from the rest of the QDR.

**From your position as Special Assistant for Chemical and Biological Defense, what do you think about the CBDP management model?**

Well, if we go back to the original Browder Report and what came out of it, we've talked about the JRO, JSTO and JPEO. It is an indication that the panel was on-target and that people on the Hill listened regarding what we felt was needed. If you want to go further, you can include test and evaluation as well. What's it all about? The process of education, training and field exercises that gets our troops knowledgeable about the threat, tells them how to use the gear and gives them the opportunity to become proficient in what they have to do in conditions that approximate what they might see during an operation.

**With regard to continuing CBRN scenarios that may involve nations or non-state entities, do you see anything on the horizon that you want people in the CBD community to pay particular attention to?**

As I indicated earlier, as we moved through the 1990s, the decade provided us with the realization that the threat was more than on the battlefield. Before, where we were primarily concerned with the chemical aspect of chemical, biological, radiological and nuclear threat, we had to look at terrorism and what could possibly be done in a biological sense, as the Tokyo subway attacks showed. And shortly after 9/11, there were the anthrax letters, so clearly, the threats we face now are coming from different directions and we all have to recognize this and think forward to what may come in the future.

**How does the DoD coordinate with the Department of Homeland Security and other government agencies, industry and academia to ensure technology and equipment are made available for homeland security? How will you look to facilitate the process?**

We've got a long way to go, but coordination is going on more and more as we go through the process of figuring out who does what and where it applies. We have to know that some of the things will cross boundaries but a lot of the issues we felt we were going to have to deal with domestically are becoming more and more real. There is a point where the Chemical and Biological Information Analysis Center is working toward this goal, it being the focal point for chemical and biological scientific and research information. Perhaps that is where we need to look for the process, the model and expand on it.

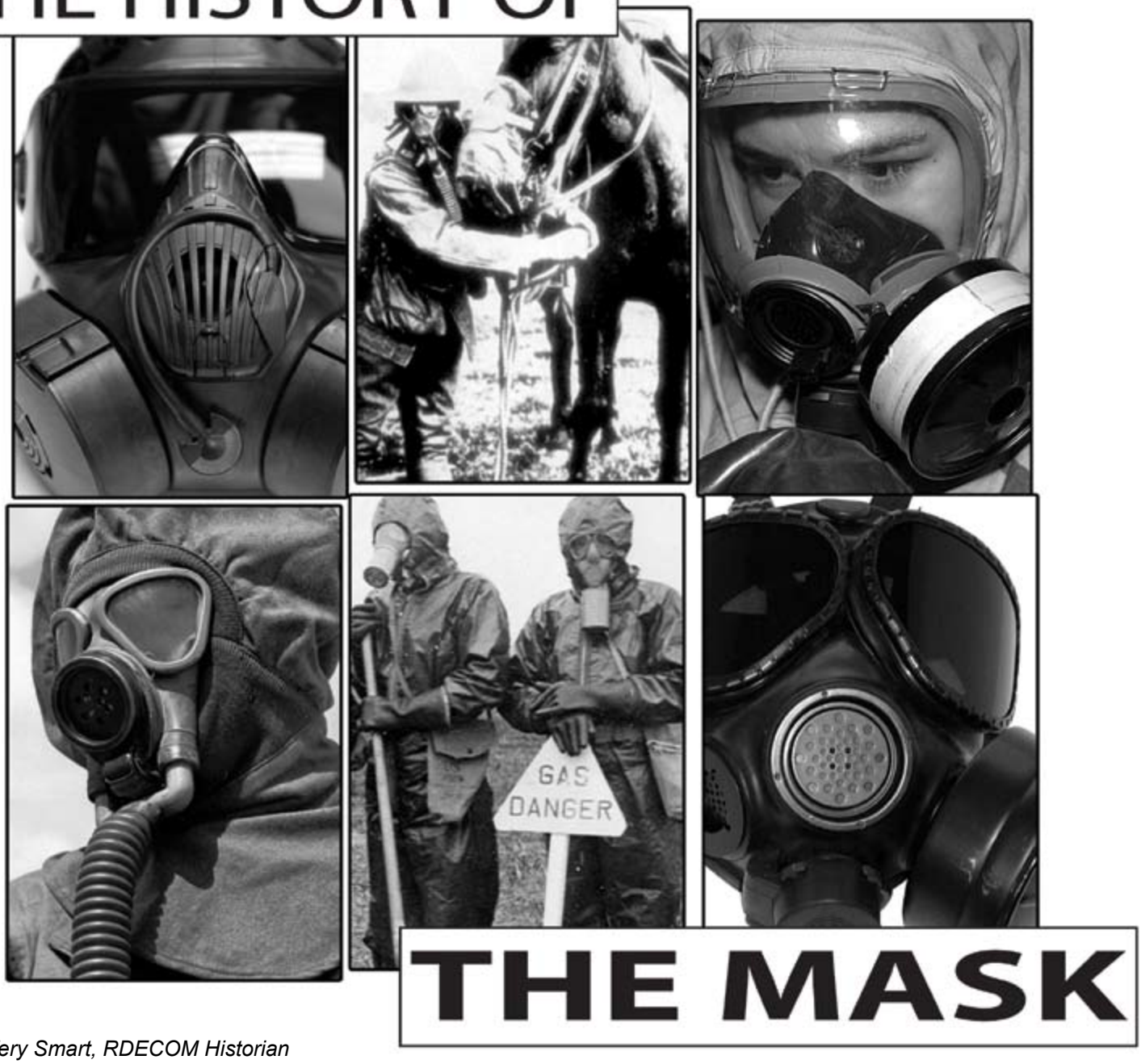
**What do you consider the greatest accomplishments of the CBDP so far?**

It's what the people in the program who have done it day-to-day for the past 20 years have done in insuring that they're delivering the best gear to the young men and women who are in the line of fire. It shows in the overall improvement in training and equipment and in the increased coordination between the services. It is because of the incredible people we have serving in the military. They have embraced the fact that chemical and biological defense is now a part of the landscape of warfare – and even in homeland security – and they take steps to ensure they're as ready as they can be to survive and operate in a contaminated environment.

**Is there anything else you'd like to add?**

It's a pleasure to be back in the department. It has been 30 years in the Army, 15 on the Hill and now I'm back in OSD with the opportunity to work on a very meaningful program and some very hard problems. It's a very serious business with a very serious objective – protecting the men and women who are the jewels of our nation.

# THE HISTORY OF THE MASK




*By Jeffery Smart, RDECOM Historian*

The concept of using a mask to protect against toxic fumes dates back long before World War I, when chemical materials were first used as weapons in "modern" warfare. In fact, one of the earliest proposals for the design of a protective mask comes from the notes of Leonardo da Vinci. In the 16th Century, da Vinci described a simple protective mask to protect sailors against a toxic powder weapon, which was also one of his proposals. In 1849, Lewis P. Haslett of Louisville, KY, was issued the earliest known U.S. patent for a protective mask. He patented his Inhaler or Lung-Protector for "protecting the lungs against the inhalation of injurious substances." The mask filter was wool or some other porous substance moistened with water, according to U.S. Patent 6,529, issued June 12, 1849.

Throughout the next 70 years, other U.S. inventors developed a variety of masks to protect industrial workers and firemen from toxic fumes. These early masks also introduced the use of carbon as a filtration material, a form of which is still in use today.

While protective masks were available to the private sector, the Army was unprepared for chemical warfare and had to use borrowed foreign equipment when the United States entered the war in April 1917. Soldiers were initially issued a British Small Box Respirator (S.B.R.) for the highest level of protection and a French M2 mask for long-term wear comfort. Unfortunately, the untrained troops had a tendency to first put on the S.B.R. following a gas attack and then switch to the M2 when it appeared they would have to wear a mask for an extended period of time. Of course, during the mask switching, many Soldiers inhaled toxic chemicals and became casualties.

The Small Box Respirator facepiece was made of an impervious rubber material and had a nose clip that required breathing through a rubber mouthpiece. This arrangement proved extremely uncomfortable after a short time. The mouth quickly became dry and it was difficult for leaders to shout commands. In addition, moisture constantly fogged the eyepieces. A flutter valve served as the exhaust for exhaled

carbon dioxide. A flexible tube connected the facepiece to the canister which held alternating layers of absorbent charcoal and oxidizing granules of alkaline permanganate. More than 20 million of these type masks were made for British and American Soldiers. Conversely, the French M2 Mask was relatively comfortable, being made of 32 layers of treated fabric. There were no inlet or outlet valves and the soldier breathed through the material. More than 29 million of these masks were manufactured during the war.

An improved version of the British S.B.R. was developed in October 1917 and referred to as the C.E. mask. This mask was slightly more comfortable to wear and used a canister containing activated coconut charcoal, soda-lime, and cotton pads to protect against toxic smokes. The facepiece was more impermeable to all known chemical warfare agents. Approximately 1.6 million of the masks were produced during the war. Further improvements led to the development of the Model 1919, and eventually the M1 mask. The facepiece was made of stockinette-cover rubber and had crimped, non-replaceable eyepieces. It came in five sizes. The original canister was replaced with improvements over the years. In 1928, the Army standardized the M1A1 mask that replaced the original eyepieces with replaceable eye lenses. Both masks came in five sizes.

The critical need for a mask that allowed cleared communication while shouting orders and talking on a telephone was first identified during World War I. This need led to the development of the Diaphragm mask after the end of the war. Initially, the Navy requested such a mask, but once developed by the Army, it was standardized in 1925 as the M1 Diaphragm (then designated the Type II facepiece) mask. The mask was stockinette-covered sheet rubber with crimped on safety glass eyepieces. The hose from the canister was connected to the side of the angle tube and then divided inside the mask to deliver the air around a speaking diaphragm. The diaphragm was made of a single layer of Bakelite-linen composition. The mask came in four sizes. A later version, the M1A1 Diaphragm mask, made minor improvements to include screwed on safety glass eyepieces and also came in four sizes. The M1 and M1A1 Diaphragm masks were obsoleted in 1944.

In 1939, the Army developed a lightweight training mask with a fully molded rubber facepiece. The training mask proved so popular and effective that the facepiece from the M1 Training mask was standardized as the M2 Service mask and the M1A1 Training mask facepiece as the M2A1 Service mask in 1941. The basic difference between the M2 and M2A1 Service masks was the outlet valve. The M2 series masks were the first service (or field) masks to eliminate stockinette coverings. The masks came in three sizes: small, large and universal. The development of an improved outlet valve resulted in the standardization of the M2A2 mask in 1942. Additional improvements to the outlet valve resulted in the M2A3 mask being standardized in 1944. More than 8 million of the M2 series masks were produced during World War II. The masks were obsoleted for field use in 1949, however, the facepiece continued to be used for special purposes after that.

During World War II, the bulky weight of the M2 series masks resulted in the demand for a lightweight mask. In 1942, the M3 Lightweight mask was standardized. The overall weight was 3.6 pounds compared to 4.6 pounds for the M2A2 mask. The M3 had a fully molded rubber facepiece with an interior nosecup to prevent lens fogging. The hose from the facepiece to the canister was reduced from 27 inches to 18 inches. The mask came in three sizes: small, large, and universal. The Army procured more than 4 million M4 masks during World War II. In 1944, an improved outlet valve resulted in the standardization of the M3A1 mask.

The need for a lightweight assault mask resulted in the M5 Combat mask in 1944. The design eliminated the hose attached to the canister and put the canister directly on the facepiece, a design change that has carried through to today. The facepiece was made of synthetic rubber (neoprene) and came in three sizes: small, large and universal. More than 500,000 M5 masks were produced during the war. American troops landing at Normandy on D-Day and during other amphibious operations carried this mask. The mask was obsoleted in 1947 when it was replaced by the new M9 mask, which featured both right or left canisters and changes to the carrying bag that made it lighter, less bulky and easier to produce. More than 3 million of the M9A1 masks were procured until 1959. Due to the popularity of the mask for special purposes other than combat and the unavailability of M17 masks for National Guard and Army Reserve units, the M9 and M9A1 were redesignated for special purposes only in 1967 and retired in 1993 and 1997 respectively.

To resolve problems associated with the M9 mask to include the need for a large canister on the side of the mask that could in certain situations pull the mask away from the face, the Army standardized the M17 mask in 1959. The need for a separate canister was eliminated by placing the filter material in cheek pockets. This also eliminated the need for right and left-handed masks. A voicemitter was added to improve speech transmission. The mask initially came in three sizes. In 1966, a drinking tube and a resuscitation tube were added resulting in the M17A1. The resuscitation tube was later dropped and a new extra small size added in 1983 when the M17A2 mask was standardized. The original M17 mask was obsoleted in 1993.

The XM30 mask was an experimental mask that was never standardized, but provided a unique design that was used in later masks. The Joint Service Operational Requirement for a new mask to replace the M17 series masks, the M24 Air Crew mask, M25 Tank mask, M9A1 Special Purpose mask, and the Navy Mk V mask was signed in 1978. The XM30 had a large, flexible bonded in silicone lens, which provided greater visibility than the M17 mask. It had front and side voicemitters, a drinking device, rapid donning, and came in three sizes. The canister was developed by Canada and had NATO threads. Additional designs included the XM33 Aircrew mask, and the XM34 Combat Vehicle Crew mask. Marring of the lens and other problems resulted in the Army dropping the XM30 mask in early 1982. The Air Force used the XM30 design for its MCU-2/P mask.

Lessons learned from the XM30 mask resulted in the M40 mask standardized in 1987. The facepiece was made of silicone rubber and came in three sizes. The canister was NATO interchangeable and could be placed on either side of the mask. The mask provided improved vision, useful life, comfort and maintenance over the M17 series masks. Several improvements to the mask resulted in the M40A1 mask in 1992. The new version included a Quick-Doff Hood, second skin for improve liquid agent resistance and an improved nosecup. The M40 series mask was first used on a limited basis during Operation Desert Storm in 1990 and was the primary mask carried during Operation Iraqi Freedom in 1993. The M40 series is still in use.

This April, the first of the new Joint Service General Purpose Masks (JSGPM) roll off the production line. The new JSGPM features better and broader protection against a wide variety of threats, as well as a more comfortable fit and integration with other warfighter equipment. With this latest version of a protective mask, designers have decreased breathing resistance and weight, and have increased protection, field of view and compatibility with binoculars, rifles and other common warfighter gear. The new joint service mask series will be fielded in 2006/2007 and will eventually replace the M40 series in the field.

# Third Semiannual CBRN Data Model Technical Review a Success

Pictured (L to R): Sheila Vachher, William Snee (SSA Data Management Lead), Janice Pelon, David Snee, and Sushma Sondhi. Not pictured are: Dr. Thomas Johnson, Edward Brinko, and Patrick Goalwin.

*By Sheila Vachher, CBRN Data Initiative Technial Lead*

The Joint Program Manager (JPM) Information Systems (JPM IS) Data Acquisition Program Manager (APM), Dr. Thomas Johnson, the Chemical, Biological, Radiological, Nuclear (CBRN) Data Initiative Team, and the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD) Software Support Activity (SSA) Data Team held their third semiannual Technical Review of the CBRN Data Model. The review was held on January 10-12, 2006 in Edgewood, MD. The Data Team's semiannual Technical Reviews brought together a group of experts from across the CBRN community to review and make recommendations regarding the CBRN Data Model. This review, in particular, provided an excellent example of collaboration between the acquisition and the science and technology (S&T) communities. Although the CBRN Data Model is a product of the acquisition community, Mr. William Ginley of the Joint Science and Technology Office for Chemical Biological Defense (JSTO CBD) volunteered to host the meeting

at the Edgewood Chemical Biological Center (ECBC) Conference Center, and several individuals from the S&T community participated in the review.

The CBRN Data Model is being developed by JPM IS for common use by the Joint Warning and Reporting Network (JWARN), Joint Effects Model (JEM), and Joint Operational Effects Federation (JOEF) programs. Because the programs share a common data model, semantic and syntactical inconsistencies among the programs can be avoided. This both facilitates information exchange and reduces development costs. The CBRN Data Model serves as a repository of Common Semantics and Syntax (CSS) for JPM IS programs. Although the CBRN Data Model is currently focused on JPM IS programs, the plan is for it to evolve and become an enterprise-wide model, spanning all CBRN Defense programs for all JPMs. Joint Project Manager Guardian is already working to extend the CBRN Data Model to support their data needs, in preparation for adopting the CBRN Data Model within the Guardian program.

The January Technical Review of the CBRN Data Model focused on version 1.3, which was released in October 2005. In contrast with previous reviews, this review focused specifically on the changes that were made between versions 1.2 and 1.3 rather than trying to cover the entire model. The reasons for this were twofold. First, many attendees had attended previous reviews and had a good understanding of the overall model already and secondly, as the model grows, it is not realistic to try to cover all the details in a few days. The review did include an overview of the CBRN Data Model methodology and structure to orient new attendees.

One of the most significant changes between versions 1.2 and 1.3 involved the addition of numerous transport and dispersion variables to the CBRN Data Model. The transport and dispersion variables added were discussed in detail, and grouped by the categories of meteorology-related variables, facility-related variables, CBRN event-related variables, and CBRN release and calculation-related variables.

Another significant change in version 1.3 was the addition of entities and attributes to describe chemical and biological sensors, and to support capture of their output. This necessitated adding entities and attributes to describe networks and electronic addresses as well. Entities were also added for radiation sensors, but they will be more fully specified in version 1.4 (due out Spring 2006).

Responding to the community's requests, the Data Team presented a use case demonstrating how to use the data model for a specific CBRN event. The specific example traced a nuclear detonation because it would be human observable and make use of numerous related entities. The Data Team outlined which entities in the data model would need to be populated in which order as the incident progressed. The use case was very well received, and in an open discussion of training approaches, several attendees recommended basing future Technical Reviews on use cases.

Miscellaneous other changes in version 1.3 were also presented to the group. These included the remodeling of entities related to CBRN event, and changes to control feature. In addition, U.S. Mission Oriented Protective Posture (MOPP) Levels and some population information were added.

In addition to the sessions that focused on the CBRN Data Model itself, on the first day, Mr. David Godso from the SSA briefed the group on architecture from the point-of-view of the JPEO-CBD. On the second day of the Review, Cmdr. Rex Cobb and Dr. Glenda Hayes from the Defense Information Systems Agency (DISA) briefed the group on Net-centric Enterprise Services (NCES) and Service-Oriented Architectures (SOA). These briefings were quite pertinent since the common CBRN Data Model and XML schema facilitate implementation of the NCES-compliant SOA.

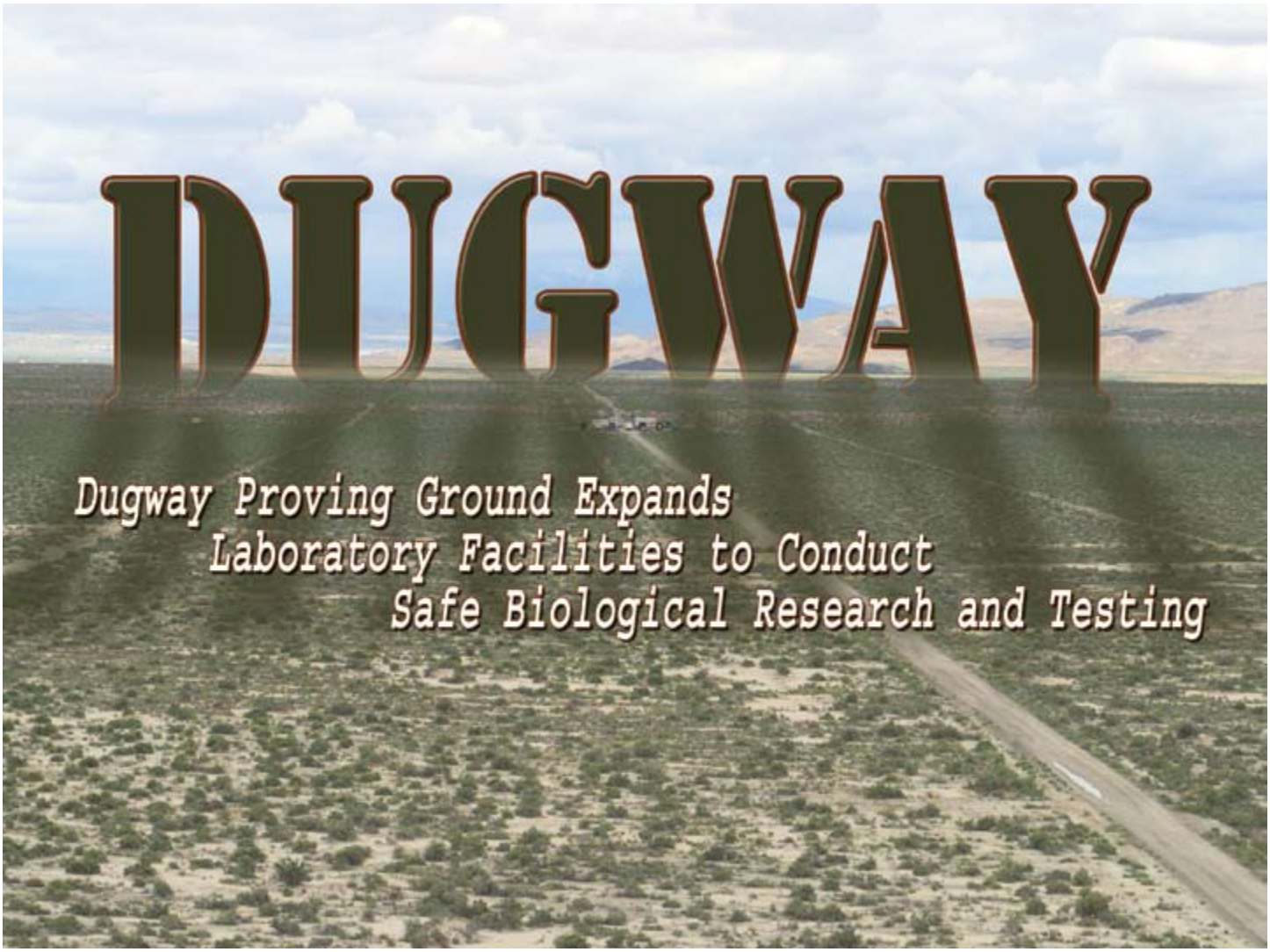
The recommendations made by attendees throughout the three-day meeting were documented in the form of action items. These were reviewed with the group, and have been published to the CBRN Data Model distribution list. Along with the conference presentations, the action items can be found on the JPEO-CBD Integrated Digital Environment (IDE) at the following link: https://jpeocbd.altess.army.mil. After logging into the IDE, please follow these links Software Support Activity/ Data/Data Products/Data Model Technical Reviews/ to see information about the current and previous reviews.

Approximately 55 people from a wide variety of backgrounds attended the technical review. The JWARN, JEM and JOEF programs were represented. There were also representatives from JPM IS, Joint Requirements Office (JRO), JPM Biological Defense (JPM BD), JPM Nuclear Biological Chemical Contamination Avoidance (JPM NBC CA), JSTO CBD, Defense Threat Reduction Agency (DTRA), ECBC, Joint Medical Information Systems Office (JMISO), and Office of the Chief of Naval Operations (OPNAV) among others. In addition, a representative from Defence Science and Technology Laboratory (DSTL) in the United Kingdom (UK) attended the technical review. The UK plans to use the CBRN Data Model for some new systems they are developing, so they are taking a strong interest in the development of the CBRN Data Model.

The next semiannual CBRN Data Model Technical Review is slated to be held in July, 2006 in San Diego, CA, although the exact dates and location have not yet been set. In general, and at the request of attendees, the Technical Reviews will alternate between the East and West Coasts, although there may be occasional exceptions.

## New Equipment Training (NET)

The JPEO-CBD has made available to all military and authorized government users training materials and technical manuals for chemical and biological defense equipment that is currently being fielded. This information can be accessed *https://secureweb.hqda.pentagon.mil/jpeocbd_secure* or from the JPEO-CBD Home Page *http://www.jpeocbd.osd.mil/* by clicking on "More JPEO-CBD" and then going to equipment training. Located on this page is New Equipment Training packages for equipment from each JPM office to include student guides, handouts, and technical manuals.




*By Al Vogel, West Desert Test Center, Dugway Proving Ground, Utah*

Work on three specially built modular laboratories is expected to begin soon, somewhat easing the crowded conditions at Dugway Proving Ground's (DPG) Life Sciences Division, the nation's premier facility for testing defenses against biological warfare agents.

The primary mission of Dugway's West Desert Test Center (WDTC), where the Life Sciences Division is located, is to test protective systems such as gas masks, detectors, protective clothing, decontaminants, decontamination systems and air filtration systems against chemical and biological (CB) agents. Under the Army Test and Evaluation Command (ATEC) and ATEC's technical tester, the Developmental Test Command, WDTC conducts a full gamut of nuclear, biological and chemical defense testing as well as research and training for CB detection and defense.

Dan Martin, chief of the Training Branch of the Life Sciences Division, said three modular units were moved to the remote biological laboratory a year ago, in February 2005.

"We have been waiting a long time for this facility to become a reality," he said. "It is a welcome addition to our capability and will provide immediate relief to the demands for space to perform national CB defense work."

Work has been slow but steady on the units, which will house one Bio-Safety Level 2 (BL-2) laboratory and three BL-3 laboratories.

The facility, containment devices, administrative controls, and the practices and procedures that constitute BL-2 are designed to maximize safe working conditions for laboratory staff working with agents of moderate risk to personnel and the environment. The agents manipulated at BL-2 are often ones to which the workers have had exposure to in the community, often as children, and to which they have already experienced an immune response.

The BL-3 is suitable for work with infectious agents which may cause serious or potentially lethal diseases as a result of exposure by the inhalation route. The BL-3 laboratories are generally located away from high-traffic areas, and there are some specific secondary barriers needed that tend to set these laboratories apart from BL-2. Although a BL-3 laboratory restricts work to pathogens for which there is a vaccine or cure, such as anthrax or tularemia, these agents are transmissible by the aerosol route, so particular attention is given to air movement. A BL-3 laboratory is also characterized by a double-door entry/exit route.

Institutions that work with biological agents must meet the stringent requirements set by the Centers for Disease Control (CDC) and the National Institutes of Health. The modular units were built by Certek, Inc., of Raleigh, NC founded in 1977, Certek was created to manufacture a decontaminating device for small rooms and laboratories. The company designed and developed the concept of modular containment laboratories, which it now manufactures in accordance with CDC approval.

An Army team inspected the modular units in late February to certify them as safe for use, as well as to make any safety recommendations before approval. State and federal environmental offices will also certify the units as safe before work in them begins.

In the Lothar Salomon Life Sciences Test Facility (LSTF) – to which the modular units are attached by a long, sealed hallway – the work has always been restricted to BL-3 or less. The modular laboratories and the main LSTF building are designed to draw air inward from exterior rooms to a central point, where the air goes through High Efficiency Particulate Air (HEPA) filters and is sterilized before release outdoors.

In the event of an unintended release of agent within a laboratory, airborne pathogens would be drawn inward by the air flow and filtered. Routine monitoring in the BL-2 portion of the LSTF is performed as a system check to ensure that pathogens are not escaping from the BL-3 areas.

Conversely, air drawn into the modulars is HEPA-filtered as well, to ensure the laboratories remain free of outdoor contaminants such as dust or naturally occurring microbes. The only outdoor entrance to the BL-2 portion of the modulars is through the modular locker rooms. Access to the BL-3 portion of the modulars is through the LSTF locker rooms, then by checking in with an access control officer prior to being allowed to enter.

As workers in the LSTF move from one room to another, each door must be fully closed before the next door may be opened. This ensures that the air-handling system is not unduly stressed. Laboratory technicians also use Class III glove boxes that contain the fermenters, where agent is grown, to protect workers from dangerous products and processes that require direct manipulation but cannot be performed using a fume hood. This adds yet another barrier to accidental release. The LSTF and its modular laboratories are also isolated in the remote Utah desert within DPG, a heavily guarded facility.

**"WE HAVE BEEN WAITING A LONG TIME FOR THIS FACILITY TO BECOME A REALITY"**

Should an accidental release occur, the concentration of the pathogens would be diluted quickly by mixing with the outside air. Additionally, ultraviolet light from the sun's rays would inactivate the organisms. These effects would render a released agent harmless by the time it traveled even a few miles.

The LSTF needed the addition because of increased work and training requirements created by increased concern over a biological attack by terrorists or rogue nations. Laboratories in the LSTF were busy with work; the additional three BL-3 and one BL-2 laboratories will somewhat alleviate the demand for workspace.

The Army is examining the possibility of expanding the LSTF to create even more office space because many workers currently have offices in trailers or share offices. "Any permanent fix is several years out, at the moment," Martin said.

The new laboratories are expected to get plenty of use. The BL-2 laboratory will be used to train various military and civilian organizations, including major police and fire departments, so they know how to recognize and handle suspected biological agents and safely obtain samples for evidence or analysis. The BL-3 laboratories will be used to culture biological agents for study and testing of biological defense materials such as detectors, protective suits, portable analyzers and air filtration systems. Martin pointed out that a disease such as anthrax requires quite a few organisms to make people sick. Tiny amounts are fought off by the body's natural defenses.

International law forbids outdoor testing with actual agents, so agents are tested indoors in chambers with redundant safety and filtration systems. Outdoors, items are tested with simulants – microbes that have similar characteristics as the agent but are benign.

At LSTF, work to defend America and its allies against biological weapons will not only continue as it has for decades, but be greatly aided by the addition of the modular laboratories.

*Al Vogel is a photographer and writer for WDTC. He can be reached at: avogel@dpg.army.mil*

# THE JEAP CONTINUES ITS SUPPORT TO THE WARFIGHTER

*By H. Jack Hart, Program Manager, Joint CBRN-D Equipment Assessment Program*

Since its inception, the Joint Chemical, Biological, Radiological, and Nuclear Defense (CBRN-D) Equipment Assessment Program (JEAP) and our JEAP Integrated Team have enhanced the materiel and combat readiness of our military services by providing outstanding surveillance, shelf life management, testing and life cycle management support for all CBRN-D Individual Protective Equipment (IPE) within the Department of Defense (DoD). There can be no doubt that significant challenges lay ahead as we seek better and more effective ways to realize the greatest value for the resources invested in this global effort. But as you will see, we are making great progress as we truly are "continuing to support the warfighter."

As a result of lessons learned from the Gulf War and recognizing the increasing threat for the potential use of Weapons of Mass Destruction (WMD), the DoD encouraged and received full Marine Corps support to expand the program's services to all military departments in 1997. In May 2003, the Joint Program Executive Office for Chemical and Biological Defense (JPEO-CBD) and the Army Acquisition Executive (AAE) chartered the Program Manager, NBCD Systems as the Joint Project Manager, Individual Protection (JPM-IP). This charter designated the JPM-IP accountable for all Joint CBRN-D IPE.

The JEAP provides support across the DoD agencies for all CBRN-D IPE under the JPM-IP office. The customers of the JEAP are the warfighter, JPEO, Defense Logistics Agency (DLA), JPM-IP, Service Representatives and Service Materiel Managers. The JEAP's mission of performing surveillance and providing Total Life Cycle Management (TCLM) support that will enhance CBRN-D equipment materiel readiness, is accomplished through the following products or services:

- Joint Service Assessments of Fielded CBRN-D Equipment.
- Cyclic Inspections for Wholesale/ Depot DoD CBRN-D Inventory
- Production Lot Testing (PLT) on all CBRN-D Equipment
- Shelf Life Testing
- Subject Matter Expert (SME)/ Technical Support for CBRN-D Equipment
- Accountability and Disposition of CBRN-D IPE

As stated in the JEAP 2005 Strategic Plan, the desired future state for the JEAP – its vision – is "to be the recognized United States Government and DoD authority and provider for CBRN-D equipment, surveillance, subject matter expertise and life cycle management support." The following information is provided to give an update of the programs of the JEAP and guidance in contacting each of the programs for support.

The Joint Equipment Assessment Unit (JEAU) conducts cyclic inspections at the wholesale and retail level to monitor and report the condition and degradation of CBRN-D IPE within the DoD.

The JEAU has sites at Camp Pendleton, CA, Camp Lejeune, NC, Kaneohe Bay, HI, Fort Worth, TX, and Okinawa, Japan. The JEAU has recently teamed with the Army Equipment Assessment Unit in Edgewood, MD, and the Air Force Protective Mask Assessment Team (PMAT) at Tyndall AFB, FL. Most recently, the JEAU at the Naval Organizational Base, Norfolk, VA was established as the eighth site. The JEAU has been a key participant in the development of new equipment, such as the Joint Service Mask Leakage Tester (JSMLT), Joint Service General Purpose Mask (JSGPM) and the Joint Service Aviation Mask (JSAM).

The staff of the JEAU is certified in visual inspection and the use of specialized test equipment for non-destructive testing of CBRN-D equipment in order to determine the mask's serviceability, monitor degradation and identify product deficiencies. Upon request, the JEAU can conduct cyclic inspections, testing and repairs of specified CBRN-D equipment at all levels of supply to assist commanders in sustaining their readiness of CBRN-D equipment. In fiscal year 2005, the JEAU's conducted two pilot cyclic inspections of DLA wholesale CBRN-D equipment, 41 Army units, 33 Marine Corps units, five Air Force units, two Special Operations Command (SOCOM) units and one Navy unit. Fiscal year 2006 is shaping up to be an even better year as the JEAU's expand and steadily increase their unit assessments with all of the Services.

The JEAP Shelf Life Extension/Toxic Testing and Joint Service Set-Aside Program (SLTT & JSSAP) plays an integral role in supporting today's warfighter by developing and providing technical expertise and information in support of DoD requirements for Shelf Life Management and Surveillance Programs. Once all acquisition level testing has occurred for a particular item of clothing or individual equipment, First Article Testing (FAT) is completed and the contracts are let for Production Lot Testing (PLT). This data is required for all articles, as it will serve as a baseline for future testing requirements.

Based upon a calculated value, and as written into procurement contracts, IPE and non-IPE items are pulled from the initial item inventory and sent to the JEAP set-aside storage facilities for shelf life management. Currently there are arctic, arid, humid and four season storage facilities used to mimic conditions that military personnel may encounter throughout the globe. Additionally, the JEAP is currently in the process of establishing a seaside site.

The process for surveillance testing begins one year prior to an item's test date. At nine months from the test date, the item is sent to a government-certified laboratory (chemical/and or physical properties-depending on testing requirements) for testing. Upon completion of the testing, an official message is disseminated to the primary services notifying them of the results (pass/fail) and the information is then loaded to the JEAP website. As a result of surveillance testing (vs. procurement costs by services) performed by the JEAP, there has been an estimated cost avoidance of more than $31 million to DoD.

The Defense Accountability, Reutilization and Disposal (DARD) program works in conjunction with the DLA and the Defense Reutilization and Marketing Service (DRMS) to provide efficient and cost-effective collection, accountability, assessment, and reutilization of serviceable CBRN-D IPE and provide training assets (i.e., suits, boots and gloves) when available and at a minimal recovery cost. The program also ensures proper demilitarization and disposal of unserviceable CBRN-D IPE.

The concept for this collaboration between the JEAP and DRMS was established in December 2002 and formalized with an agreement in April 2003. The agreement accomplished the desires and direction of Congress and the Government Accountability Office under the guidance of DLA. The focus of this effort has been to work in tandem with the regional Defense Reutilization Marketing Office's to implement the changes to material turn-in and disposal policy issued by the DLA. Policy has been established to change all CBRN-D IPE to Demilitarization Code "F" (demilitarization instructions to be furnished by the Item/Technical Manager). Intent is that no CBRN-D IPE be authorized for resale once it has been determined excess and turned in to Defense Reutilization and Marketing Office and that proper reutilization occurs for those assets found suitable.

To ensure compliance, the JEAP has established and staffed selected warehouse locations to take control of all designated excess or unserviceable CBRN-D IPE.

Designated training items are marked TRNG ONLY.

After receipt of these items, they are sorted, assessed for condition, returned to stock if determined serviceable or marked "TRNG ONLY" if suitable for training and issued to the various service units. The JEAP manages a database for maintaining proper accounting of all assets received, reutilized and disposed. Unserviceable items, which have no reutilization value, are sent directly to a DRMS Demilitarization Center for disposal. The JEAP also performs periodic surveillance of various Internet auction sites – one of the principle sources for CBRN-D IPE getting into unauthorized hands – and reports any findings to the Naval Criminal Investigative Service, which has an ongoing investigation to determine any illegal activity associated with items found on these sites.

To date, the DARD program has been successful in uncovering and reutilizing millions of dollars in assets that had previously been sold through government liquidators, most of the time for pennies on the dollar, while at the same time assisting the prevention of these assets from getting into the hands of unauthorized users. Our end state is a process that clearly identifies and accounts for all excess/unserviceable designated CBRN-D IPE throughout its disposal cycle, ensuring that unserviceable assets are destroyed and serviceable assets are returned to the warfighters as needed.

The JEAP provides invaluable data resources for the DoD and other federal agencies through web-based database systems containing technical data and data on the shelf life management of CBRN-D IPE. Our primary repository for both CBRN-D IPE technical and shelf life data is the CBRN-D IPE Shelf Life Management System website. The website provides technical specifications on each piece of IPE in the DoD inventory, and detailed shelf life data on each item, as well. This data is derived from the JEAUs, the JSSAP, the Joint Service Shelf Life Extension and Toxic Testing Program, the Defense Accountability, Reutilization and Disposal Project, FEDLOG/FLIS, and other DoD agency and service department sources. The JEAP continues to use a systematic methodology of assessment, inspection, destructive and non-destructive testing, surveillance, maintenance and training that culminates into readiness for warfighters around the globe. The website address to view all of the information and services provided by the JEAP is http://shelflife.pmnbc.com/. To learn more about the JEAP, readers are encouraged to visit the website.


*By Byron Hurst, Management Support Directorate, JPEO-CBD*

Throughout history, lifesaving inventions have had their beginnings in death. For instance, Dr. Charles Richard Drew, an African American doctor, discovered that blood could be separated into blood plasma and red blood cells. Blood plasma could be stored much longer than unseparated donated blood and was less susceptible to contamination. The use of this stored plasma to replace blood lost by wounded service members saved countless lives during and after World War II.

Another invention born of death was the gas mask. On March 25, 1911, it was business as usual on the ninth floor of the Triangle Shirtwaist Factory in New York City. The 146 employees were young immigrant girls, mostly Polish, Jewish and Italian, and were at their stations eager to leave by close of business at five in the evening. The Triangle Shirtwaist Factory was notorious for locking employees on each floor to prevent the employees from taking breaks and leaving their sewing stations. But a fire started on the eighth floor at around 4:30 p.m. Because they were on the ninth floor, no one could unlock the doors to free the employees. The workers died from the fire, smoke inhalation, and some jumped to their death, attempting to escape the burning building. The incident led to widespread investigations and new fire code regulations. It also caught the attention of a young inventor named Garrett Augustus Morgan. The seventh of 11 children, and born to former slaves in Paris, KY, March 4, 1877, Morgan overcame tremendous hurdles in becoming a successful businessman. Hiring a private tutor to teach him to read and write played a vital role in his developing a lifesaving device. After reading about the fire deaths, concern for his workers inspired his action.

Because he was a textile and sewing industry employer with 32 employees, Morgan felt his staff could potentially meet a similar fate. His response came in 1912, when he created the Safety Hood and Smoke Protector. Morgan called his invention a Breathing Device. This mask contained a cotton, heat-resistant hood and two hoses that extended to the ground. Morgan recognized that during a fire, the air closer to the floor was purer and safer to breath while smoke and toxic fumes rose. The end of one of the tubes contained an absorbent that was

moistened before use. This material cooled the air before the wearer inhaled. The other tube was for the wearer to exhale. The device also incorporated a backpack-like container that held unpressurized air.

Morgan obtained a patent on October 13, 1914 for the Breathing Device, patent numbers 1090936 and 1113675, which he later called the Safety Helmet. While African Americans had the right to patent their inventions after the Civil War, during the early 1900s, marketing and selling their patents were practically impossible, especially in the South.

Essentially prohibited from selling his own invention in the South, Morgan employed a white man to take credit for and sell his invention. The individual whom he hired would take his name and go by "Mr. Morgan" while the real Garrett Morgan pretended to be an "Indian assistant." He was not just an inventor, he was a shrewd businessman.

He displayed marketing acumen as well, demonstrating the capability of his Breathing Device by burning sulfur formaldehyde and manure while a volunteer wore his invention. After 20 minutes of exposure, the individual who wore the Breathing Device showed no side effects, even when enclosed and isolated with these burning substances.

More proof came from a second tragedy, which launched the Breathing Device to center stage and finally brought credit to its inventor and enough attention to make the U.S. Army take notice. In the early morning of July 25, 1916, while Morgan was at home with his wife Mary and their sons, an explosion trapped 32 men in the tunnels for the Cleveland Waterworks at roughly 3 a.m. The men were trapped in smoke- and gas-filled tunnels 250 feet below Lake Erie, and five miles off shore. A bystander at the location recalled Morgan's Breathing Device and went to his house to see about obtaining the masks. Morgan, while still in his pajamas, contacted his brother and two volunteers. Together they ventured 200 feet into the tunnels until they found the first man whom Morgan carried back up. He returned into the gas-filled tunnels several times to rescue the trapped victims using his Breathing Device. He and his crew saved more than 20 people.

Despite this brave act, Cleveland authorities refused to recognize him, owing to the prejudice of the time against African Americans. The city instead awarded the Carnegie Medal for Heroism to one of the volunteers that assisted Morgan. However, Morgan's actions garnered so much publicity that fire departments around the country ordered Breathing Devices from his company.

By 1917, the United States entered into World War I and the U.S. Army incorporated Morgan's Breathing Device along with several other models into designs the British had developed in order to protect American Soldiers from the chlorine gas and other harmful poisonous gases the German army employed. Even though Morgan's Breathing Device was intended to aid in domestic tragedies during peace time, his invention went on to save the lives of American Soldiers exposed to German chemical attacks during World War I.

Soon Morgan, who had shown his skill in repair, invention and chemicals (while attempting to repair a sewing machine, he created and patented the first chemical hair straightener) gained a great deal of popularity beyond the United States and Great Britain for his life-saving devices. Demand for his products continued to increase, and he was invited to many exhibits throughout the country.

Later, a committee of prominent Cleveland citizens presented Morgan with an award that was made of gold and diamond studs. The inscription read, "To Garrett A. Morgan, Our Most honored and Bravest Citizen."

Morgan, who started his own firm repairing sewing equipment in 1907 and grew it into several businesses in the textile and sewing industry, received two gold medals in 1916 from the International Exposition of Sanitation and Safety and from the International Association of Fire Chiefs. He no longer needed a white businessman to sell his breathing device.

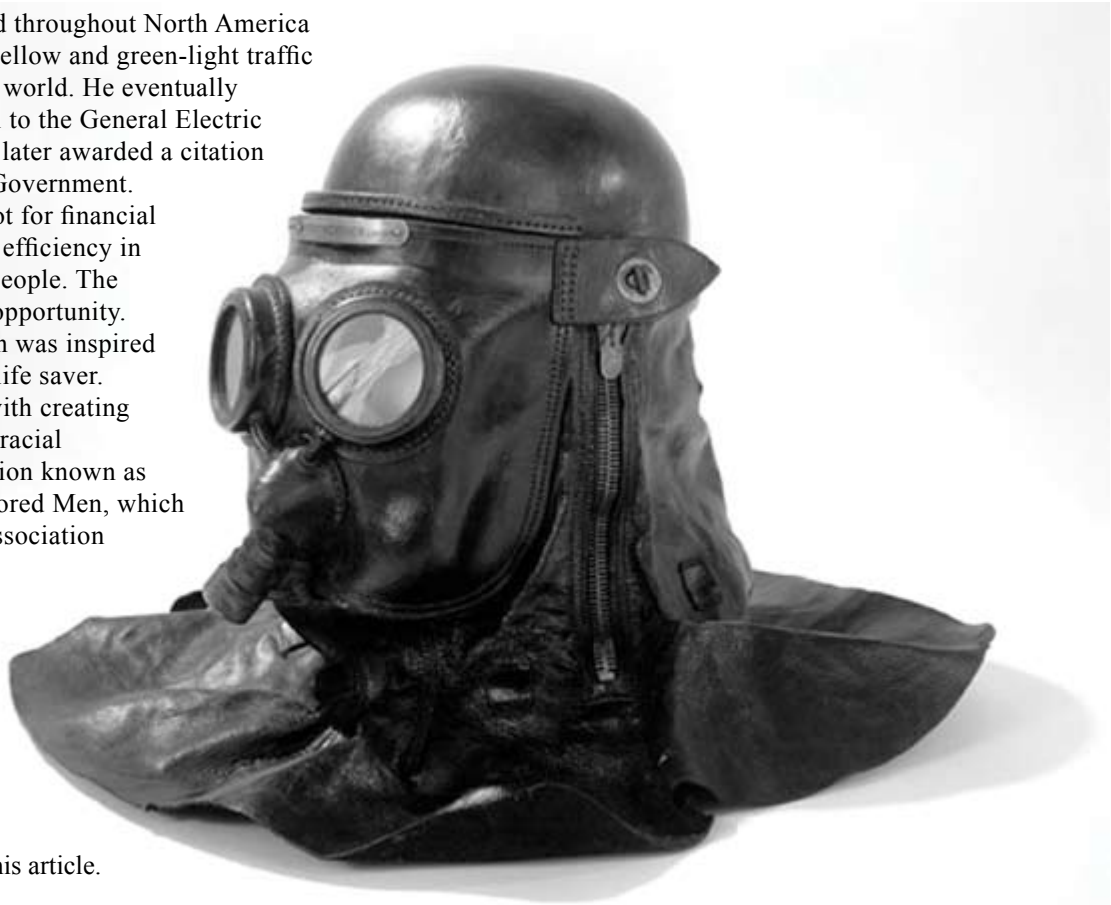
By 1920, Morgan entered the newspaper business and became very prosperous. He was able to obtain several other patents in North America and England. He invented the traffic signal in response to another tragedy, this time a collision between an automobile and a horse-drawn carriage while on his way to work. He was noted for this invention, because the T-Shape, three-way traffic signal provided for the pedestrian right of way requiring all cars at an intersection to come to a complete stop. Morgan's traffic



World War I gas masks: Nurses putting gas masks on wounded German soldiers, WWI. Americans produced several gas masks which had features from Morgan's Safety Hood.


management technology was used throughout North America until it was replaced by the red, yellow and green-light traffic signals currently used around the world. He eventually sold the rights to his traffic signal to the General Electric Corporation for $40,000. He was later awarded a citation for the traffic signal by the U.S. Government.

His motivation to invent was not for financial security. It was a way to increase efficiency in his businesses and to help other people. The events of his time gave him that opportunity. Moved by the loss of life, Morgan was inspired to create an invention that was a life saver. Morgan wasn't simply satisfied with creating inventions. Dedicated to fighting racial inequality, he joined an organization known as the Cleveland Association of Colored Men, which later merged with the National Association for the Advancement of Colored People (NAACP). He remained a member until his death on August 27, 1963 at the age of 86. He survived by his two great-grand children, Garrett Augustus Morgan IV and Angela Morgan.



Mr. Stephen Gude contributed to this article.

# TERRAIN DECONTAMINATION implementing the DECON SPRAY BAR

*By Demetrios K. Prapas and Robert Silks, Edgewood Chemical Biological Center (ECBC), Engineering Directorate, Decontamination Team*

The threat of widespread chemical contamination of forward tactical and strategic targets and terrain is a continued concern of military planners and with the high importance of maintaining operational tempo at airfields, strategic posts and vital roadways, providing effective terrain decontamination is a critical component of mission execution.

Edgewood Chemical Biological Center (ECBC) is working closely with the U.S. Army Chemical School, 23rd Chemical Battalion, Joint Service Project Manager Decontamination Office, and Army Tank and Automotive Command (TACOM) to examine the current status of the military's terrain decontamination capability and offer potential solutions.

The military's primary large-scale terrain decontamination device is the M12A1 Decontamination Apparatus (M12A1). When the M12A1 was first developed, it was mounted in the bed of either the M54 or M809 series, 5-ton cargo truck. To perform terrain decontamination, the operators would typically sit on seats affixed to the front fenders and apply decontamination solution in front of the vehicle as it traversed terrain. When the Army replaced these vehicles with the Family of Medium Tactical Vehicle (FMTV), M1083, 5-ton cargo truck (a cab-over-engine design) there was no place for the operators to sit and spray decontamination solution.

System engineers have concentrated on practical design requirements as well as upgrades to operator safety. A number of proposed systems encompassing a mounted spray bar are currently under consideration and will undergo evaluations during this quarter. These efforts, including development, fabrication and prototype testing, will ensure that the options presented to the U.S. Chemical School will satisfy operational and material compatibilities.

The ECBC engineers developed a 23-pound prototype spray bar, based on a preliminary design by the 23rd Chemical Battalion. The prototype bar can easily by mounted to the shackle brackets of the M1083 by one Soldier in several minutes. The conceptual design concentrated on the routing and securing of hoses, selection and positioning of nozzles, and mounting brackets. Commonality of parts, ease of set-up and use, minimal weight, and overall design simplicity were key considerations. Some other benefits included: (a) reduced manpower requirements- as a minimum one less Soldier is required to perform the terrain decontamination mission; (b) improved safety issues. This means that Soldiers no longer have to hang from or walk in front of the vehicle to perform terrain decontamination. Additionally, these Soldiers have less exposure to contamination when using the spray bar.

The ECBC Terrain Decontamination Spray Bar concept was demonstrated to representatives from JPEO, the US Chemical School and the 23rd Chemical Battalion with favorable results on February 16, 2006 at Aberdeen Proving Ground, Edgewood Area. That same spray bar was demonstrated during an exercise at Fort Lewis, Washington in April. Over the next few months, the terrain spray bar will be refined and eventually finalized for fielding.

In Fiscal Year 2003 the M12A1, originally designed in the 1960s, was modernized to bring it back to full readiness for deployment to the Persian Gulf region. Engineers replaced the gasoline engine with a modern diesel engine, simplified and modernized the system's controls, replaced burner units to increase system performance, and made adjustments to the fuel tank to increase operating time before refueling is necessary. As the M12A1 is expected to be the primary large-scale decontamination device for the next 10 years, engineers also have been working to strengthen the industrial base support to ensure adequate parts supply and development.

The military's primary large-scale terrain decontamination device is the M12A1 Decontamination Apparatus (M12A1).


Engineers and the Edgewood Chemical and Biological Center developed a 23-pound prototype spray bar, based on a preliminary design provided by the 23rd Chemical Battalion.

Photos by Steve Lusher

# Amphibious Ships Getting "Backfit"

*By Stephen Gude, Assistant Editor, Chem-Bio Defense Quarterly Magazine*

Navy officials recognized the need for its amphibious warfare ships to be able to operate in a chemical and biological (CB) environment during the Quadrennial Defense Review (QDR) of 1997. They found that without a dedicated Collective Protection System (CPS), the unique design and environment aboard a U.S. Navy ship presented a difficult situation for personnel in case of a CB attack.

Their consensus resulted in the creation of a the CPS Backfit program to equip amphibious assault ships of the Tarawa and Wasp classes with CPS "zones" from which the ship could be operated and essential functions, such as medical and landing force operations, could continue to be conducted if the ship was involved in a CB event.

"The QDR highlighted the need for augmented protection," said Mark Blanco, the acquisition program manager for CPS Backfit. He was aboard the *USS Bonhomme Richard* (LHD-6) the latest ships to be retrofitted. "The areas needing protection included medical, casualty receiving, and command and control operations. The CPS backfit includes modifications that will provide this CB protection. We touch many parts of the ship in one form or another, whether it's a modification to a bulkhead or creating a new passageway."

The $9 million CPS backfit aboard the Bonhomme Richard, includes the installation of a new casualty decontamination station, airlocks, fan rooms, filter plenums, bulkheads, doors and hatches. The installation that was completed February 24, didn't change the architecture of the ship enough to force Sailors and Marines to have to learn their way around again though.

Blanco quickly described one of the most important areas, the medical department. "Medical is a big part of the CPS backfit installation," he said. Blanco relayed a scenario that envisioned CB casualties being flown onto the Bonhomme Richard from a beachhead established by Marines during an amphibious assault and how the ship's medical zone would work. After being flown in, the wounded are taken into a two-stage casualty decontamination station, separated by a sealed bulkhead and vented to the outside of the ship.

Here, they are decontaminated before being sent in for treatment. The first part of the stage is where gear and uniforms are shed and either decontaminated or marked for destruction. The second part is where the individual is decontaminated. Once cleared from the decontamination station's specially designed casualty airlock, the individual is then ushered into the medical department for treatment.

Once out of the decontamination station the individual is in a CPS "zone" that is protected by a gas adsorber and High Efficiency Particulate Air (HEPA) filtration system that restricts infiltration of CB agents into protected areas. Maintaining the CPS "zone" in an overpressure condition prevents the infiltration of CB contaminants through any penetrations or "leaks" along the CPS "zone boundary". The system is configured in multiple zones, so that if a zone fails the other zone(s) will operate without endangering crewmembers. The filtration system features M98 Gas Particulate Filter Sets that can flow 200 cubic feet of air per minute per filter set; the filters are housed three deep in shock qualified aluminum housings.

"Each zone has pressure alarms and controls that remotely report zone status," Blanco said. "If something goes wrong, the ship's crew knows about it right away and can take measures to correct it."

The amphibious assault ships *USS Tarawa* (LHA-1), *USS Belleau Wood* (LHA-3), *USS Peleliu* (LHA-5), *USS Wasp* (LHD-1), *USS Essex* (LHD-2), *USS Kearsarge* (LHD-3), *USS Boxer* (LHD-4) and *USS Bataan* (LHD-5) have also recieved the complete CPS backfit installation. The new San Antonio-class amphibious transport dock ships, which accompany the larger amphibious assault ships in an amphibious ready group, have the collectively protected zones built into the ship along with Arleigh Burk-class Destroyers, and Whidbey Island-class Dock Landing Ships. On the amphibious assault ships, the backfit modifications take from 14 to 20 weeks and up to 90,000 man hours of labor to complete.

"When we do a backfit, we affect a large portion of the ship," Blanco said. "At the same time, as we're going through the modifications, the spaces are returned to the crew in the same if not better condition than when we started. Our objective is that when we're done, the ship is ready to go to sea."

Doug Barker, a project manager on the backfit construction on USS Bonhomme Richard demonstrates a pressure check at an entrance point.

In fact, the backfit is tested during sea trials, usually within days after the construction is completed, Blanco said. "While they're out to sea, we conduct leak tests in the "zones". The equipment is certified prior to sea trials, but we test the system as a whole. In a lot of areas, we've had to do work that modifies decks, bulkheads and doors, and we want to be sure the modifications perform as expected."

"When we backfit a ship with CPS 'zones', we are enhancing its ability to survive and operate in a CB environment. And if we've increased their survivability and sustainability, we've enhanced their chance of mission success."

# MODELING and SIMULATION IMPACTS COMPLEX DESIGN and PROGRAMMATIC DECISIONS

*By Rita Bellini-Goetze (Camber), Dr. Edward Splitt, Rob Steward, Tasha Stryker (Booz Allen Hamilton)*

The Guardian Installation Protection Program (IPP), a program within the Joint Program Executive Office for Chemical and Biological Defense to protect 200 military installations world-wide from chemical, biological, and radiological (CBR) threats, developed and accredited the IPP System Effectiveness Model. This model is composed of a set of modeling and simulation tools to help evaluate installation designs and make programmatic decisions.

This suite of tools, called the Homeland Defense Analysis Toolkit (HDAT), was developed by Booz Allen Hamilton, Inc., (BAH) under the IPP technical support contract for Modeling and Simulation System Effectiveness. The HDAT assists a product manager to make a myriad of acquisition and design decisions and measure the performance of a design before it is fielded. By catching key design flaws before they are fielded, HDAT can perform analysis to help define alternative operational procedures and new design requirements early in the acquisition process and avoid fielding delays and unexpected costs. This innovative toolset is the first of its kind that has the ability to effectively model complex military environments, multiple threats, and innovative designs that combine materiel (e.g. sensors, warning systems, etc.) and non-materiel components (i.e. operational procedures, training, and exercises) into one Family of Systems (FoS).

Acquiring, designing and fielding an IPP FoS capable of protecting military installations from chemical, biological, and radiological threats is a challenge that has been laid out by various requirements to include the Department of Defense directive 2000.12 "DoD Antiterrorism Programs," 18 August 2003. The goals of the IPP are to ensure continuity of operations of critical missions, protect installation personnel and restore the essential functions of an installation. To meet those goals, the Guardian program relies on a FoS that consists of:

- CBR detection equipment
- Warning systems
- Collective Protection
- Individual Protective Equipment
- Information Management / Decision Support Systems
- Response Operating Procedures
- Training & Exercises

Two of the challenges facing IPP are to design a cost-effective FoS solution and to determine how this tailored FoS will improve upon the current operational capabilities and procedures at the installation. The Joint Project Manager, Col. Camille Nichols, adopted a decision support methodology that utilizes a suite of computer simulations to help perform this analysis.

The HDAT was designed to be easily modified, incorporate the materiel solutions chosen by the program and represent the impacts of operational procedures (CONOPS) and training on installation protection. To reduce development cost and maximize confidence in the results, HDAT was designed to incorporate government and commercial-off-the-shelf (COTS) modeling software as much as possible consisting of validated threat plume models Hazard Prediction & Assessment Capability (HPAC), Vapor Liquid Solid Tracking Model (VLSTRACK), and Areal Locations of Hazardous Atmospheres (ALOHA). The use of one modeling software versus another is dependent on the type of threat scenario being modeled. The use of Extend®, a COTS tool used to create the Response Effectiveness Model (REM), allows for easy modification of the model and accounts for variations in threats (CBR), base/facility geography, design, and service specific policy and operating procedures, to enable a quick turn around analysis of any installation.

The REM, a discrete event Monte Carlo simulation, depicts

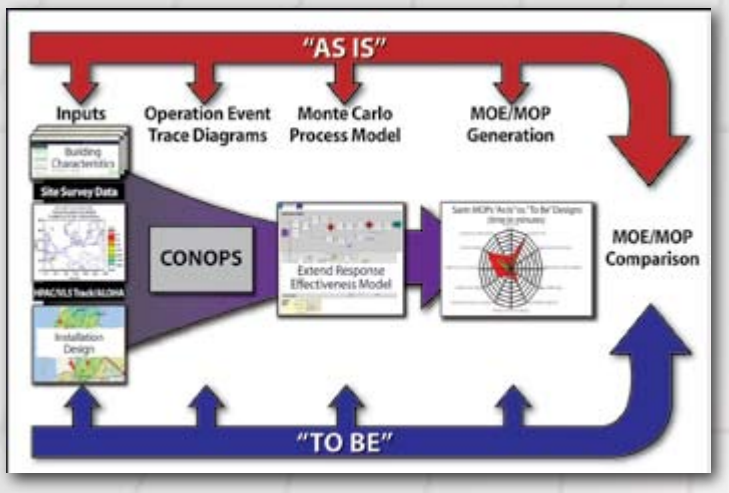



Figure 1. The System Effectiveness Process Using HDAT

the 'race against the clock' to detect, warn and protect populations, before they succumb to the effects of CBR agents. Figure 1 is a representation of how HDAT is used to determine the system effectiveness of FoS designs for an installation. The end product is the comparison of Measures of Effectiveness (MOE) and Measures of Performance (MOP) of the installation prior to Guardian IPP, "As Is" and after, represented by the "To Be" Design.

This process incorporates multiple CBR worst case attack scenarios, the physical geometry and attributes of the installation, and the design of the installation. The design, however, is not limited to the physical components of the system such as sensors, individual protection and collective protection. It also incorporates operational procedures and performance improvements due to training and advanced warning to mitigate the threat of a CBR attack. These procedures and associated times to complete these procedures are captured in event trace diagrams that ultimately are the basis of design of the REM. These event trace diagrams are unique for each design and threat.

The REM utilizes simulated plume data generated for the appropriate threat scenario to estimate the exposure of personnel based on their location relative to the plume (Figure 2) and incorporates how they would respond to the incident. This response includes the time it takes the installation to detect the threat, warn its respective populations, take protective action and begin treatment. This

Figure 2. Example of Persistent Chemical Plume Dispersion

time-space-operational procedure sensitive exposure is the basis for determining if a member of a given population is a fatality, severe casualty or mild casualty. These casualties are estimated using the latest casualty estimation methods outlined in the Potential Military Chemical/Biological Agents and Compounds Field Manual (FM 3.11-9) adopted by each of the U.S Armed Services in June 2004.

In addition to casualties, other operational metrics are calculated by the REM. Estimates of the number of critical missions that have become inoperable due to the CBR event are calculated, as well as stochastic measures of the time it takes the installation to detect, make a decision, warn, protect

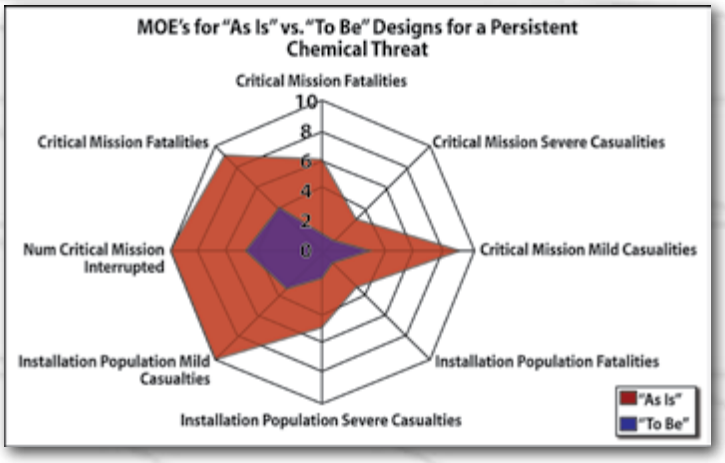



Figure 3. Example Radar Plot Representation of Measures of Effectiveness (MOE)

and begin treatment. These metrics combined with casualty metrics create a complete picture of system performance and are calculated for the current state of the installation ("As-Is") and compared against the IPP ("To-Be") design for identical threats (see figure 1). The As-Is and To-Be are displayed together in the form of 'radar plots' (Figure 3). These plots allow Guardian to easily identify the benefit of the program on each particular installation for each type of threat.

System effectiveness analysis is not the only type of analysis for which the IPP has used HDAT. Some examples of others studies include trade studies to compare the performance with alternate configurations, studies to determine which components in the FoS design provide the most benefit to the installation and sensitivity analysis to drive component design. Rapid analysis capability like this allows the Project Manager and her staff to make informed programmatic and design decisions with an analytic basis, measure the value of her program and be adaptable to swift programmatic change.

Modeling and simulation is used extensively by the IPP not only for engineering design, but also for programmatic purposes. Analysis based upon modeling and simulation runs are used to measure the system effectiveness of a candidate design before it is fielded, drive FoS designs, and to test alternative capabilities and procedures in the face of programmatic uncertainty. By incorporating modeling and simulation in the design process, the IPP has saved money and increased the effectiveness of FoS designs that will significantly reduce fatalities, casualties and critical mission interruptions in the event of a CBR attack.

In October 2005, the IPP System Effectiveness Model underwent the Verification, Validation, and Accreditation (VV&A) process judged by a panel of multiple DoD agencies. The System Effectiveness Model obtained final approval by the JPMG in December 2005. This major milestone provided the project manager with added flexibility allowing the use of this accredited tool to make faster and more accurate acquisition decisions.

# 'The Reason for Our Success is Our People'

*Photos by Steve Lusher*


















The Joint Program Executive Office for Chemical and Biological Defense bids fair winds and following seas to Navy Capt. Scott White who retired after 25 years of loyal, dedicated service. In a ceremony held January 24, 2006, Brig. Gen. Stephen Reeves, several Joint Program Managers, family members and friends attended the ceremony at the Admiral Kidd Club, Fleet Anti-Submarine Training Center, San Diego, CA. Capt. Thomas O'Keefe, Joint Program Manager, Information Systems, presided over the ceremony that highlighted Captain White's distinguished career. After serving the majority of his career as an H-46 Sea Knight helicopter pilot, Captain White's final duty was fulfilled as the Deputy JPM IS. He was presented the Legion of Merit award for exceptionally meritorious conduct and outstanding achievements in an extremely difficult duty performed in an exceptional manner.

## Mr. Edward Wack
## Future Acquisitions

Mr. Edward Wack joined the Joint Program Executive Office for Chemical and Biological Defense as the Director for Future Acquisitions on March 1st, 2006. He will be responsible for leading the JPEO's future technology strategy and coordinating that strategy with the other members of the chemical and biological defense program. Of particular importance will be defining the CBR system of systems concepts for Major Defense Acquisition Programs (MDAPs) such as the Army's Future Combat Systems (FCS) and the Navy's Littoral Combat Ship (LCS).

Before joining the JPEO, Mr. Wack spent 13 years at MIT Lincoln Laboratory, a Federally Funded Research and Development Center (FFRDC) administered by the Massachusetts Institute of Technology (MIT). Lincoln Laboratory's mission is to research and develop technology for the national defense. Most recently, Mr. Wack was an Assistant Group Leader in the Sensor Systems and Applications group where he led a team working on standoff sensing, advanced detection algorithms, and system architectures. Mr. Wack has also been involved in various aspects of satellite remote sensing programs including system architectures, sensor designs, sensor calibration and requirements analysis and definition.

Mr. Wack earned a Bachelor of Arts in Mathematics from Holy Cross College in Worcester, MA.